Are graduating residents competent enough? The results of a national gap analysis survey of program directors and graduating residents in Japan

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Abstract

Purpose: To determine the self-assessed competency of graduating residents (GRs) in Japan upon completion of their residency and to determine the gap between their competency and the competency expected by their program directors (PDs).

Method:

A list of 31 essential surgical procedures was compiled according to the consensus of surgical educators from around the country. A survey with this list was sent to all 909 GRs and their 611 PDs in 2016. The GRs rated their competency to perform these procedures and the PDs were asked to evaluate the expected competency of their GRs using the Zwisch Scale.

Result:

The response rate was 56.3% for the GRs and 76.8% for the PDs. For ten (32%) procedures, less than half of the GRs felt confident performing these. For most procedures, GRs self-reported competency was lower than was reported as expected by their PDs. This gap was more than 10% for 13 of the procedures.

Conclusion:

More than half of the GRs in Japan lacked the confidence in their skills to perform one-third of the procedures selected for this study. The results of this study should be used to update the surgical education curriculum in Japan.

Keywords:

Surgical residency training

Surgical Education

Competency

Gap-analysis

Curriculum

Introduction:

The Japan Surgical Society (JSS), which oversees surgical residency training in Japan, defines board-certified surgeons vaguely as medical professionals who have undergone the required amount of training and have the required knowledge and skills to provide standard surgical care to their patients (https://www.jssoc.or.jp/). However, in the current system, while the knowledge of the trainees is evaluated via a written exam and an interview, skill evaluation is not a requirement to become a board-certified surgeon in Japan. The requirement of experience of 350 surgeries (120 as the operator) is also very low compared to the 850 surgeries required by the American Board of Surgery (http://www.absurgery.org/). We currently lack the data on whether Japanese board-certified surgeons are adequately skilled and have confidence in their surgical skills.

Some studies, published primarily in North America, have focused on the confidence and perceived competence of graduating surgical residents (GRs) in their operative skills. Some of these studies have demonstrated that GRs have general confidence in their operating skills and readiness to practice [1, 2]. However, other studies have highlighted the lack of confidence in GRs concerning various aspects of surgical care [3, 4, 5]. Few of these studies have analyzed the gaps between the expectations of the program directors (PDs) and GRs. Bell et al. [6] noted that of the 121 procedures that PDs considered essential for GRs to be competent in, only 18 had been performed more than ten times by the residents. Another study that compared the responses of PDs and GRs found statistical differences in the opinion values of the two groups on different learning resources; they agreed, however,

on the areas of weakness in their program [7]. These studies have helped shape residency training in North America [8].

Outside of North America, surveys on GRs' operative competence have rarely been undertaken. We recently published the first national survey on the condition of surgical residency training in Japan [9]. The residency training system in Japan differs vastly from the systems in North America or Europe in terms of access to simulation training and focus on subspecialty training [9]. To evaluate the surgical residency training in Japan and to improve it, we need to collect data from surgical residents in Japan. The first part of the survey focused on the current state of surgical residency training in Japan [9].

The primary objective of the second part of the survey was to determine the self-assessed competence of Japanese GRs in their skills upon graduation from the residency program. The secondary objective was to determine the skill level PDs expected of their GRs and to assess the gap between the PDs' expectations and the GRs' confidence.

Methods

This survey was the second part of the survey reported earlier [9]. The research proposal for the parts of the survey was approved by the institutional review board of the JSS (JSS2016-1). The participants were required to provide written consent before participating in the survey and were assigned a unique identification code. The participants had the right to retract their responses at any time.

Essential surgical procedures:

In the survey, the GRs were asked to self-assess their operative competency in essential surgical procedures using the Zwisch scale [10]. This is a simple scale which rates the competency of the procedure according to four levels: (1) Show and Tell, where the attending surgeon needs to guide the trainee through each step of the procedure; (2) Active Help, where the trainees know the procedure but the attending surgeon needs to actively lead the trainees with more than 50% of the procedure; (3) Passive Help, where the trainee is almost independent and is able to lead for more than 50% of the procedure but requires help from the attending surgeon in difficult areas; and (4) Supervision Only, where the trainee can finish most of the cases with little help from the attending surgeon [11]. The PDs were asked to rank their expectations of competency among their GRs based on the same scale.

As the JSS curriculum does not have essential surgical procedures, we developed the list of essential surgical procedures for this study. A working group composed of surgical educators from around the country was formed under the educational committee of the JSS.

This was divided into eight subgroups based on subspecialty: gastrointestinal tract surgery, gastrointestinal solid organ surgery, cardiovascular surgery, thoracic surgery, pediatric surgery, breast surgery, endocrine surgery, and trauma surgery. All of the surgical procedures listed in the JSS curriculum were listed and divided into the above subcategories (https://www.jssoc.or.jp/). The members of these subgroups were asked via an online survey to choose the procedures in their subcategory in which they beleived the GRs should be almost independent with the competency of “Passive Help” or “Supervision Only” on the Zwisch scale described above. All of the procedures selected by the members were included to form a preliminary list for the next round.

In the next round, the members of the working group and the educational committee of the JSS voted anonymously on the preliminary list. They were asked to choose which procedures they beleived that the GRs should have a competency of above “Passive Help” using the Zwisch scale. The procedures selected by more than 60% of the respondents were included in the final list.

Survey

As reported earlier, two separate paper surveys were sent out in December 2016 to all the GRs who finished their training program in 2016 and their PDs. The survey material consisted of an explanation of the objectives of the survey, an informed consent form, a consent withdrawal form, a return envelope, an envelope for the survey, and a link to the online survey for those who were comfortable filling out the survey online. The online

platform was created using www.surveymonkey.com. The survey was open for 40 days, and two email reminders with a link to the online survey were sent during this period.

The response of the two groups for each procedure was divided into the below Active Help group and above Passive Help group, and the responses of the GRs and PDs were compared. For the procedures where majority of the responding GRs had low self-assessment, sub-analysis was done based on their graduation year from medical school (graduation from medical school in 2011 vs. the rest), age (younger than 33 year old vs. the rest), gender, type of hospital where they trained (university hospital vs. community hospital vs. both), subspecialty orientation (gastrointestinal surgery vs. thoracic surgery vs. cardiovascular surgery vs. breast surgery vs. others vs. not decided), and reported number of surgical cases under general anesthesia (more than 200 cases vs. 150-199 cases vs. 100-149 cases vs. less than 100 cases).

Statistical Analysis

All of the data were presented as the number of respondents (percentage of respondents). The $\chi 2$ Test and Fisher's exact test were used to the compare categorical data. The p-value of <0.05 (two-tailed) was considered significant in all of the analyses. All of the statistical analyses were completed using SPSS version 17 (IBM, New York, NY).

Results:

Essential procedures:

From the list of 853 main surgical procedures listed in the curriculum of the JSS, the subgroups of the working group selected 67 procedures. Thirty-seven members of the working group and educational committee of the JSS voted on this preliminary list. For this survey, 31 procedures were selected by more than 60% of the members as essential procedures.

Participants:

The survey was sent out to 909 GRs from the year 2016 and their 611 PDs. The response rate of the GRs was 56.1% (510/909) and 76.1% (465/611) for the PDs in the second part of the survey. As reported earlier, nearly half of the GRs graduated with the minimum required training period of four years. The majority of responding GRs had an interest in pursuing a career as a gastrointestinal surgeon. Nearly 7% of the GRs had performed fewer than 100 cases under general anesthesia during their training period (Table 1).

Competency:

Fewer than 25% of the GRs reported their level to be above passive help for splenectomy, lung wedge resection, lung bullectomy, and thyroid lumpectomy. For 10 procedures, fewer than half of the GRs reported their level to be above passive help (Table 2)

For most of the procedures, the perceived resident readiness was reported to be lower among the GRs compared with the expected readiness by their PD. This gap was more than

10% for 13 of the procedures and more than 30% for hemorrhoidectomy, splenectomy, breast needle biopsy, lung bullectomy and thyroid lumpectomy (Table 2).

For most of the ten procedures, where less than half of the GRs reported their level to be above passive help, graduation year, age, and hospital type did not have a significant effect on their confidence level. GRs pursuing subspecialties were significantly more confident in procedures of the same subspecialty compared to the rest of the GRs. Female GRs had higher self-reported competence in breast procedures, and GRs with experience in more than 200 cases had significantly higher self-reported competence in most of the procedures (Table 3; Supplement Tables).

Discussion:

This is one of the first studies to examine operative competency of GRs outside of North America. This study presents the self-assessed operative competency of GRs in Japan, the expected competency by their PD, and the gap between the expected and actual competency for selected surgical procedures. The GRs were expected to be competent in these surgical procedures by the members of the educational committee and the working group of the JSS, who represented the decision-making body for the development of curriculum for surgical residency in Japan. This study found that while more than half of PDs had similar opinions to that of the members of the JSS committee, more than half of GRs' expressed lower confidence in their ability to perform one-third of the selected procedures than expected.

In a similar study done in Canada, nearly half of GRs required assistance for the majority of the operations for laparoscopic adrenalectomies, neck dissections, and laparoscopic splenectomies [12]. In our study, of the 31 essential surgical procedures selected, less than half of GRs had an expected self-assessed competence of above Passive Help in breast and lung procedures, distal gastrectomies, hemorrhoidectomies, splenectomies, and thyroid procedures. This highlights the changing paradigm of general surgical procedures being performed and the hospitals where residents are trained in Japan. As demonstrated by our earlier study, very few of the GRs and PDs identify themselves only as a general surgeon [9]. Most GRs are simultaneously training for a subspecialty and give more preference to

the procedures of their subspecialty. As demonstrated by our study, most of the GRs had expected competency in the procedures of their subspecialty.

For gastroenterological surgeries, such as hemorrhoidectomies and splenectomies, which are thought to be common surgeries by PDs, there was lower self-assessed competency even among the GRs training to be gastroenterological surgeons. With new sclerosing procedures, which requires a special license to perform, hemorrhoidectomies are moving from general hospitals to highly specialized clinics and with specialized surgeons performing the procedures [13, 14]. The introduction of minimally invasive surgery has replaced open surgery for splenectomies in the developed world and made it a complex surgery [15]. A study published in 2001 indicated that only 4% of the residents were expected to perform more than ten splenectomies before graduation [16]. Despite the age of this study, laparoscopic splenectomy is still considered an advanced laparoscopic procedure. A recent study demonstrated that the incidence of vocal fold palsy in thyroidectomies increased when performed by a general surgeon compared to head and neck surgeons [17]. These studies highlight the increasing shift toward specialized care and away from generalized care provided by a general surgeon, and the training experience of GRs reflects this in our study.

However, the need for general surgery cannot be denied completely, and rural areas still require general surgeons. However, the North American model of general surgical residency, which includes five years of training and mandatory rotation through each subspecialty and 850 surgeries as primary surgeon, is still inadequate to prepare them for

rural surgical practice [18]. The Blue Ribbon committee on surgical education formed in 2002 recommended a basic surgical core curriculum covering the basic surgical skills, professionalism, ethics, and practice management followed by specialization training either in general surgery or a subspecialty of their choice [19]. More GRs are pursuing fellowships in North America as they feel that they are not yet ready to practice [12, 20]. Subsequent studies have demonstrated that these fellowships have been successful in preparing the surgeons for independent practice [21]. Early sub-specialization programs integrating general surgery and subspecialty across variety of subspecialties have shown promising results [22]. Experience of 350 cases, is a great deal less than that required in North America; however, it should be considered that the training for general surgery residency in Japan is three years. The training itself is flexible based on the individual need and overlaps with the sub-specialization training. General surgery board certification is merely a milestone on the way to complete the training as a subspecialist. In practice, it follows the pattern recommended by the Blue Ribbon committee. However, the current curriculum can be biased toward gastrointestinal surgery, with its requirement of 50 cases. It is also ambiguous regarding the skill level the trainees are expected to have at the end of the training. Our study indicates that GRs are not confident in the procedures outside of their subspecialty interest. The curriculum needs to reflect this, and early sub-specialization should be adopted in the curriculum too. As recommended in our earlier paper, the curriculum should identify the core surgical competency that is required across the subspecialty while retaining the flexibility of the curriculum[9]. It should allow the trainees to pursue various subspecialties, including general surgery, while removing ambiguity by

setting the goals for the knowledge and skill level the trainees in each subspecialty need to achieve.

Skill assessment as a part of board certification is still in its infancy. The American Board of Surgery (www.absurgery.org) has recently mandated at least six operative performance assessments using a validated assessment tool, the Operative Performance Rating System [23]. Similarly, in the United Kingdom, the Intercollegiate Surgical Curriculum Programme (www.iscp.ac.uk) mandates 360-degree workplace-based assessments using validated tools, including the use of Procedure-Based Assessments and Direct Observation of Procedural Skills in surgery [24]. The surgical curriculums of these countries are constantly evolving from syllabi that were similar to the current curriculum of the JSS, to a specific curriculum with well-defined goals and objectives for each level [25]. These curricula have embraced competency-based education in surgery amenable to the changing training environment. However, the challenges of the procedural assessments remains, such as the workload on the faculty and the performance of the faculty as raters. A recent study illustrated that faculty members with assigned educational roles were more likely to perform work-based assessments than other faculties [26]. Assigning faculty roles and training faculty members to use a variety of assessment tools are necessary. The curriculum of the JSS also needs to change and align itself with the changing training needs and new trends in surgical education to produce competent surgeons.

The JSS requires the trainees to perform more than 120 cases. However, the difficulty level and case types are required to be performed are not fixed thus, the trainees may perform

120 cases of suturing of lacerations and still be eligible to sit for the board certification examination. In our current study, around 7% of responding GRs had performed fewer than 100 cases under general anesthesia. Our survey also demonstrated that their self-assessed competency was low compared to that of their peers in most of the procedures. Although the length and objective of the residency training differ, the number of required procedures has increased to 850 in the United States; also, there is a list of essential surgical procedures that trainees must experience before graduating. It is also necessary to reassess the number of required procedures in Japanese surgical residency training. Focus should be placed not only on the number of procedures but also on the list of essential surgical procedures that the trainees must experience. However, while doing this, we must keep in mind the procedures that the trainees are performing and allow for the flexibility to accommodate various subspecialties.

This study has several limitations. This study uses self-assessments from the GRs and not a formal assessment of their surgical skills; therefore, it may not reflect the level of surgical skills of the GR. The Zwisch scale used in this study has not been validated for self-assessments, and the GRs who used the scale were not trained to use this scale. However, the scale is relatively easy to understand, and we used a detailed explanation in Japanese on the level of expertise that was expected in each of the four levels. With this survey we were able to demonstrate the level of self-assessed competence of GRs across various procedures in which they were expected to be competent, and we assessed the various factors that affected their competency. We also assessed the expected competency of their PD, the gap between their expected competency, and the self-assessed competency of GR.

Another limitation of our study is the response rate of the GRs, which is on the lower side at 56.1%. The bias of responding GRs might have effect on the results of this study. However, considering the age group we were targeting, we gave the participants option of using either postal or online survey. The response rate was consistent with other surveys using similar modules. Subsequent studies should consider using options such as on-site surveys during a written examination or surveys with incentives to increase the response rate.

Conclusion

More than half of the GRs lacked the confidence in their skills in one-third of the procedures selected for this study. The results of this study should be used to update the surgical education curriculum in Japan.

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Conflict of Interest Statement:

Authors Saseem Poudel and other co-authors have no conflict of interest.

Reference:

1. Bucholz EM, Sue GR, Yeo H, Roman SA, Bell RH, Jr., Sosa JA. Our trainees' confidence: results from a national survey of 4136 US general surgery residents. Arch Surg. 2011;146:907-914.
2. Friedell ML, VanderMeer TJ, Cheatham ML, Fuhrman GM, Schenarts PJ, Mellinger JD, et al. Perceptions of graduating general surgery chief residents: are they confident in their training? J Am Coll Surg. 2014;218:695-703.
3. Fonseca AL, Reddy V, Longo WE, Gusberg RJ. Are Graduating Surgical Residents Confident in Performing Open Vascular Surgery? Results of a National Survey. J Surg Educ. 2015;72:577-584.
4. Fonseca AL, Reddy V, Longo WE, Gusberg RJ. Graduating general surgery resident operative confidence: perspective from a national survey. J Surg Res. 2014;190:419-428.
5. Fonseca AL, Reddy V, Longo WE, Udelsman R, Gusberg RJ. Operative confidence of graduating surgery residents: a training challenge in a changing environment. Am J Surg. 2014;207:797-805.
6. Bell RH, Jr., Biester TW, Tabuenca A, Rhodes RS, Cofer JB, Britt LD, et al. Operative experience of residents in US general surgery programs: a gap between expectation and experience. Ann Surg. 2009;249:719-724.
7. Shofler D, Chuang T, Argade N. The Residency Training Experience in Podiatric Medicine and Surgery. J Foot Ankle Surg. 2015;54:607-614.
8. Elfenbein DM. Confidence Crisis Among General Surgery Residents: A Systematic Review and Qualitative Discourse Analysis. JAMA Surg. 2016;151:1166-1175.
9. Poudel S, Hirano S, Kurashima Y, Stefanidis D, Akiyama H, Eguchi S, et al. A snapshot of surgical resident training in Japan: results of a national-level needs assessment survey. Surg Today. 2019; 49:870-876.
10. George BC, Teitelbaum EN, Meyerson SL, Schuller MC, DaRosa DA, Petrusa ER, et al. Reliability, validity, and feasibility of the Zwisch scale for the assessment of intraoperative performance. J Surg Educ. 2014;71:e90-96.
11. DaRosa DA, Zwischenberger JB, Meyerson SL, George BC, Teitelbaum EN, Soper NJ, et al. A theory-based model for teaching and assessing residents in the operating room. J Surg Educ. 2013;70:24-30.
12. Nadler A, Ashamalla S, Escallon J, Ahmed N, Wright FC. Career plans and perceptions in readiness to practice of graduating general surgery residents in Canada. J Surg Educ. 2015;72:205-211.
13. Abe T, Hachiro Y, Ebisawa Y, Hishiyama H, Kunimoto M. Distal hemorrhoidectomy with ALTA injection: a new method for hemorrhoid surgery. Int Surg. 2014;99:295-298.
14. Hachiro Y, Kunimoto M, Abe T, Kitada M, Ebisawa Y. Aluminum potassium sulfate and tannic acid (ALTA) injection as the mainstay of treatment for internal hemorrhoids. Surg Today. 2011;41:806-809.

15. Moris D, Dimitriou N, Griniatsos J. Laparoscopic Splenectomy for Benign Hematological Disorders in Adults: A Systematic Review. In Vivo. 2017;31:291-302.
16. Rattner DW, Apelgren KN, Eubanks WS. The need for training opportunities in advanced laparoscopic surgery. Surg Endosc. 2001;15:1066-1070.
17. Kohnen B, Schurmeyer C, Schurmeyer TH, Kress P. Surgery of benign thyroid disease by ENT/head and neck surgeons and general surgeons: 233 cases of vocal fold paralysis in 3509 patients. Eur Arch Otorhinolaryngol. 2018;275:2397-2402.
18. Gillman LM, Vergis A. General surgery graduates may be ill prepared to enter rural or community surgical practice. Am J Surg. 2013;205:752-757.
19. Debas HT, Bass BL, Brennan MF, Flynn TC, Folse JR, Freischlag JA, et al. American Surgical Association Blue Ribbon Committee Report on Surgical Education: 2004. Ann Surg. 2005;241:1-8.
20. Coleman JJ, Esposito TJ, Rozycki GS, Feliciano DV. Early subspecialization and perceived competence in surgical training: are residents ready? J Am Coll Surg. 2013;216:764-771; discussion 771-763.
21. Watanabe Y, Madani A, Bilgic E, McKendy KM, Enani G, Ghaderi I, et al. Don't fix it if it isn't broken: a survey of preparedness for practice among graduates of Fellowship Council-accredited fellowships. Surg Endosc. 2017;31:2287-2298.
22. Klingensmith ME, Potts JR, Merrill WH, Eberlein TJ, Rhodes RS, Ashley SW, et al. Surgical Training and the Early Specialization Program: Analysis of a National Program. J Am Coll Surg. 2016;222:410-416.
23. Larson JL, Williams RG, Ketchum J, Boehler ML, Dunnington GL. Feasibility, reliability and validity of an operative performance rating system for evaluating surgery residents. Surgery. 2005;138:640-647; discussion 647-649.
24. McKee R. The Intercollegiate Surgical Curriculum Programme (ISCP). Surgery (Oxford). 2008;26:411-416.
25. Phillips AW, Madhavan A. A critical evaluation of the Intercollegiate Surgical Curriculum and comparison with its predecessor the "Calman" curriculum. J Surg Educ. 2013;70:557-562.
26. Latif A, Hopkins L, Robinson D, Brown C, Abdelrahman T, Egan R, et al. Influence of Trainer Role, Subspecialty and Hospital Status on Consultant Workplace-based Assessment Completion. J Surg Educ. 2019;76:1068-1075.

Table 1: Demographic of the Graduating Residents:

	Number of Respondents (%)
Age, mean (SD)	32.8 (3.1) years
Gender	
Male	396 (79.8)
Female	100 (20.2)
Years in training	
4years	252 (49.6)
5years	110 (21.7)
6years	63 (12.4)
>6years	83 (6.3)
Subspecialty orientation	
Gastroenterological	291 (57.1)
Cardiovascular	58 (11.4)
Thoracic	57 (11.2)
Breast	40 (7.8)
Other	50 (9.8)
Not decided	14 (2.7)
Procedures under general Anesthesia performed	
<100	34 (6.7)
100-149	60 (11.9)
150-199	71 (14.1)
>200	339 (67.3)

Table 2: Perceived readiness of graduating residents (GR) and expected readiness of their Program Directors (PD) in each procedure using Zwisch Scale*. Results shown as %of responders' response.

Procedures	**Passive Help/ Supervision only**	
	GR	PD
1. **Distal Gastrectomy** [a]	43%	52%
2. Gastrostomy/Closure [b]	60%	86%
3. Ulcer perforation repair	64%	72%
4. Gastro-jeujenal bypass [b]	62%	77%
5. Partial intestinal resection	74%	79%
6. Ileus Surgery	66%	62%
7. Appendectomy	86%	92%
8. Colectomy	65%	69%
9. Colostomy	72%	78%
10. **Hemorrhoidectomy** [a, c]	41%	82%
11. Cholecystectomy	78%	82%
12. **Splenectomy** [a, c]	21%	52%
13. Inguinal hernia repair	84%	89%
14. Ventral Hernia repair	70%	78%
15. Peritonitis	55%	53%
16. **Total Mastectomy** [a, b]	44%	61%
17. **Partial Mastectomy** [a, b]	45%	74%
18. **Breast Needle Biopsy** [a, c]	47%	86%
19. **Sentinel Lymph dissection** [a, b]	47%	73%
20. **Lung Wedge Resection** [a, b]	24%	51%
21. Lung Bullectomy [a, b]	25%	63%

22. Subcutaneous lumpectomy	90%	94%
23. Body surface lymphadenectomy	91%	94%
24. Tracheostomy [b]	64%	86%
25. **Thyroid lumpectomy** [a, c]	19%	65%
26. Local Anesthesia	94%	95%
27. Spinal Anesthesia [b]	72%	91%
28. Intubation	94%	95%
29. Arterial Puncture	96%	96%
30. Central line insertion	96%	96%
31. Chest tube insertion	96%	95%

[a] Procedures with self-reported competency below passive help in more than half of the responding GR.

[b] Procedures with the difference of more than 10% between the self-reported competency of GR and expected competency by their PD.

[c] Procedures with the difference of more than 10% between the self-reported competency of GR and expected competency by their PD.

*Zwisch Scale [10, 11]:
1. Show and Tell: The attending needs to guide the trainee through each step of the procedure.

2. Active help: The trainees know the procedure but the attending needs to actively lead the trainees in more than 50% of the procedure.

3. Passive Help: The trainee is almost independent and is able to lead for more than 50% of the procedure but requires help from attending in difficult areas.

4. Supervision Only: The trainee can finish most of the cases with little help from the attending

Table 3: Factors associated with lower self-assessment in procedures. Data presented as the p value of Chi square test.

	Graduation Year[1]	Age[2]	Gender[3]	Hospital Type[4]	Subspecialty[5]	Case Number[6]
Distal Gastrectomy	0.06	**0.03**	**<0.01**	**<0.01**	**<0.01**	**<0.01**
Hemorrhoidectomy	0.17	**0.01**	0.22	0.32	**<0.01**	**<0.01**
Splenectomy	**<0.01**	**<0.01**	**<0.01**	0.25	**<0.01**	0.08
Total Mastectomy	1.00	**0.03**	**<0.01**	0.73	**<0.01**	**<0.01**
Partial Mastectomy	0.47	0.06	**<0.01**	0.74	**<0.01**	**<0.01**
Breast Needle Biopsy	0.37	0.07	**<0.01**	0.58	**<0.01**	**<0.01**
Sentinel Lymph dissection	0.86	**0.01**	**<0.01**	0.15	**<0.01**	0.07
Lung Wedge Resection	0.83	0.75	**0.04**	0.59	**<0.01**	0.66
Lung Bullectomy	0.92	0.46	0.12	0.45	**<0.01**	0.55
Thyroid lumpectomy	0.42	0.57	0.67	0.32	0.61	**0.02**

[1] Graduated in 2011 vs rest

[2] Younger than 33 years old vs rest

[3] Male vs Female

[4] University hospital vs Community hospital vs Both

[5] Gastrointestinal Surgery vs Cardiovascular Surgery vs Thoracic Surgery vs Breast Surgery vs Others vs Not decided

[6] More than 200 cases vs 150 -199 cases vs 100 – 149 cases vs less than 100 cases